1) Express $\dfrac{2\tan\left(\dfrac{\theta}{2}\right)}{1-\tan^2\left(\dfrac{\theta}{2}\right)}$ as a **single** trigonometric function. Simplify as much as possible.

2) Simplify $\sin\left(\dfrac{\pi}{2}-x\right)+\sin(\pi+x)+\sin\left(\dfrac{3\pi}{2}+x\right)+\sin(2\pi-x)$.

3) Determine the exact value of the trigonometric ratio $\sin\dfrac{5\pi}{12}$. Rationalize the denominator.

4) If $\tan x=-\dfrac{3}{4}$ and $\dfrac{3\pi}{2}\le x\le 2\pi$, determine the exact value of $\sin 4x$.

5) Determine the solutions for each equation on the interval $0 \le x \le 2\pi$. Give exact solutions, where possible. Round approximate solutions to the nearest hundredth of a radian.

a) $-5\cos x + 3 = 2$

b) $2\sin 3x + \sqrt{3} = 0$

c) $\sin x + \sin x \tan x = 0$

d) $\cos 2x - 3 = 5\cos x - 4\cos^2 x$

6) Prove the following identities.

a) $\dfrac{\sin 2x + \sin x}{1 + \cos x + \cos 2x} = \cot\left(\dfrac{\pi}{2} - x\right)$

b) $(\sec x - \cos x)(\csc x - \sin x) = \dfrac{\tan x}{1 + \tan^2 x}$

7) Determine the exact value of $\tan\frac{\pi}{8}$. **Show all work and simplify your answer as much as possible**.

8) Solve $\csc\theta = 2.7451$ for $-720° \le \theta \le 720°$. Round your answers to the nearest tenth of a degree.

9) Using other identities, develop the tangent subtraction formula $\tan(x - y) = \dfrac{\tan x - \tan y}{1 + \tan x \tan y}$.